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STUDIES ON THE HISTORY AND CLASSIFICATION OF THE FAMILY ECHINOSTOMATIDAE WITH REDESCRIPTION OF *ECHINOSTOMA BANCROFTI* FROM *FULICA ATRA*, THE FIRST RECORD FROM INDIA

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ABSTRACT: The Echinostomatidae is a large group of Digenetic trematodes parasitizing a large group of vertebrates all over the world. Despite availability of a vast literature on the family, confusion still prevails on the position of several genera. Several eminent helminthologists viz., Dietz(1909,1910), Odhner (1911), Travassos (1922), Faust (1929), Mendheim (1943), Skrjabin *et al* (1956), Ben Dawes (1948), Yamaguti (1948), Kostadinova (2005) and others have contributed enormously to our knowledge of this group of parasites. Apart from history and classification of the family, human Echinostomiasis caused by heavy infection of certain Echinistomes has also been discussed. A redescription of *Echinostoma bancrofti* Johnston (1928) based on the newly collected specimens from a new host *Fulica atra* is also given which is the first record from India.

Key words : Trematode, Echinostomatidae, *Echinostomum, Fulica atra.*

INTRODUCTION

Swammerdam (1737/ 1738) published "Biblia Naturae" which is believed to be the first book in which Echinostomes were described (Kanev *et al,* 2000). The Echinostomatidae is a family of digenetic trematodes parasitizing mammals, birds and lower vertebrates and distinguished with an anterior end modified and beset with a collar of spines. A family with vertebrates as final hosts has a worldwide distribution with 91 nominal genera (Kostadinova, 2005).Though located mostly in intestines, cases have been reported from bile duct, gall bladder, ureters and urinary tubules of kidney, cloaca and bursa fabricii of birds. The systematic relationship within this group has been worked upon by several helminthologists. Though Dietz (1909-1910) attempted to explore the systematic relationship within this group but the foundation of working out the systematics of the family Echinostomatidae was laid by such eminent workers viz., Odhner (1910), Skrjabin et Schul'ts (1937), Mendheim (1943), Bashkirova (1941), Sudarikov (1950), Skrjabin et Bashkirova (1956), Yamaguti (1957,1958), Odening (1963), Sudarikov et Karmanova (1977) and others (Kostadinova, 2005).

The type genus *Echinostomum* was created by Rudolphy in 1899 with *Distoma echinatum* Zeder, 1803 (*Fasciola (Echinostomum revolutum)* Froelich,1892 as type species on the basis of a crown of large spines round a collar shaped extension at the anterior end of body. Looss (1899) created two new genera, *Stephanostomum* for *S. cesticillus* Mollin (1858) and *Acanthostomum* for *A.spiniceps* Looss (1896) and in the same paper created a new subfamily Echinostominae for all the species of *Echinostomum* Rudolphy described upto that time. He also maintained that the genera *Psilostomum* Looss,1899 and *Stephanostomum* Looss,1899 are closely related to Echinostome group and subsequently raised the status of the subfamily Echinostominae to the rank of a family which he named as Echinostomidae.

Then for a long time the systematic study on this group was at a standstill though many species were created and added haphazardly under *Distomum* or *Echinostoma* till Dietz (1909,1910) described various species and after a thorough study gave a clear diagnosis of the various genera. He created many new genera and provided a key for determination of 22 *Echinostome* genera under the family. Luhe in 1909 also gave a systematic account of the *Echinostome* parasites under various genera.

Odhner (1911) divided the family Echinostomidae Looss into three subfamilies with the diagnosis and assigned many genera to their respective subfamilies, leaving out some of the genera, the systematic position of which he could not properly determine. The three subfamilies recognized by him are Echinostominae Looss,1899; Himasthlinae Odhner,1911 and Echinochasminae Odhner,1911. Travasso in 1922 created

a new subfamily Chaunocephalinae Travassos while describing a new species *C.panduriformia.* Nicoll (1923) created one more subfamily Parechinostominae for the rest of the unclassified genera like *Parechinostomum* Dietz,1909. Though Odhner (1910) and Mendheim (1943) doubted the validity of the genus *Parechinostomum*, Bashkirova(1941), Skrjabin et Bashkirova (1956) and Odening (1963) considered *Parechinostomum* a synonym of *Echinoparyphium* but Yamaguti (1958,1971) accepted its validity. However Kostadinova (2005), due to lack of sufficient data considered the genuineness of the genus *Parechinostomum* inappropriate and accordingly regarded it as *genus inquirendum.* Poche (1926) changed the nomenclature of the family from Echinostomidae to Echinostomatida in correspondence with the rules of nomenclature.

Faust (1929) according to his scheme of classification created the superfamily Echinostomatoidea Faust,1929 with the type family Echinostomatidae Poche, 1926. He classified the Echinostomatidae into five subfamilies viz., Echinostominae Looss,1899 with *Echinostomum* (Rudolphy,1809) as type genus; Himasthlinae Odhner,1910 with *Himasthla* (Dietz,1909) as type genus; Echinochasminae Odhner,1910 with *Echinochasmus* (Dietz,1909) as type genus; Chaunocephalinae Travassos, 1922 with *Chaunocephalus* (Dietz,1909) as type genus and Parechinostominae Nicoll,1923 with *Parechinostomum (*Dietz,1909) as type genus.

Mendheim (1943) did not accept the status of the family Parechinostominae (Nicoll,1923), created four more subfamilies and accepted the validity of nine subfamilies thus : Nephrostom(at)inae Mendheim, 1943; Echinostom(at) inae Looss,1899; Himasthlinae Odhner,1910; Echinochasminae Odhner, 1910; Pegosom(at)inae Odhner,1910; Paryphostom(at)inae Mendheim,1943; Chaunocephalinae Travassos ,1922; Petasigerinae Mendheim, 1943 and Microparyphi(i)nae Mendheim, 1943.

Ben Dawes (1946) diagnosed the family Echinostomatidae Looss,1902, emend. Poche,1926, Stiles et Hassal,1926 as: Elongate, spinous, muscular distomes with closely approximated suckers, ventral powerful; fleshy head collar with single or double coronet of collar spines. Cirrus pouch generally present; testes ovoid, sometimes slightly lobed, directly or diagonally behind one another in posterior region. Ovary often in front of testes, median or slightly on the right side. Vitellaria well developed, mostly in posterior region, lateral, sometimes merging in median plane. Uterus thickly set between ovary and acetabulum. Excretory vesicle Y shaped. Parasites of birds and mammals. He classified the family into three subfamilies thus:

I. Himasthlinae. [Genera: *Himasthla, Aporchis*]

II. Echinostomatinae. [Genera: *Echinostoma, Echinoparyphium, Euparyphium]*

III. Echinochasminae. [Genera: *Echinochasmus, Heterechinostomum, Stephanopora]*

He also identified the following isolated genera: *Hypoderaeum, Sodalis, Pegosomum, Parorchis, Paryphostomum, Parechinostomum, Petasiger, Chaunocephalus* and *Echinostephila.* He also gave a key to the genera *Echinoparyphium, Echinostoma and Euparyphium* occurring in birds.

Table 1 : Comparative data on *Echinostoma bancrofti.* All dimensions are in mm.

	Johnston, 1928	**Author's collection**
Host	*Gallinula terebrosa*	*Fulica atra*
Locality	South Australia	Srinagar,Kashmir
Body	15.7 x 1.7	15.6-16.3 x 1.61-1.88
Head Collar	0.7 x 0.1	0.83-0.88 x 1.16-1.22
Ventral sucker	1.4 x 1.3	1.47- 1.6 x 1.328-1.712
Collar spines	44	44-46
Oral sucker	0.35 x 0.37	0.38-0.43 x 0.4-0.416
Prepharynx	-	0.16-0.24
Pharynx	0.13 long	0.288-0.32 x 0.3-0.32
Oesophagus	0.6 long	0.43-0.57
Cirrus pouch	0.4 (dia.)	0.22-0.32 x 0.35-0.56
Testes	1.3-1.4 x 0.5	1.04-1.36 x 0.256-0.35
Ovary	0.5 x 0.5	0.49-0.62 x 0.41-0.48
Ova	0.08-0.11 x 0.05-0.06	0.096-0.112 x 0.064-0.08

The classification of the family Echinostomatidae has attracted the attention of several helmimthologists and has been a topic of discussion from time to time . Skrjabin *et al* (1913-1916) described, illustrated and revised description of adults, larvae and hosts of Echinostomes. Two systems were published in 1947 and 1956. Baschkirova (1941-1956) also completed two revisions of the family Echinstomatidae, published in Skrjabin Vol.I and XII in 1956. Skrjabin et Baschkirova (1956), while working on the family did not accept the validity of the subfamilies Paryphostom(at)inae, Petasigerinae and Nephrostom(at)inae created by Mendheim, 1943. Apart from erecting two new subfamilies Eurycephalinae

Skrjabin et Baschkirova, 1956 and Hypoderaenae Skrjabin et Baschkirova, 1956, accepted the validity of the subfamilies Echinostomatinae Looss,1899; Allechinostomatinae Sudarikov,1950; Chaunocephalinae Travassos,1922; Echinochasminae Odhner,1910; Himasthlinae Odhner, 1910; Microparyphiinae Mendheim,1943; Nephroechinostomatinae Oshmarin et Belous,1951; Pegosomatinae Odhner, 1910 and Sodalinae Skrjabin et Schulz,1937.Thus a total of eleven subfamilies were classified and retained by them.

Yamaguti (1933-1975) worked on morphology, biology, hosts, life cycle and systematic reorganization of Echinostomes and published two systems in 1958 and 1971 respectively. He rejected the two subfamilies created by Skrjabin et Baschkirova(1956), accepted only eight subfamilies as valid and erected four more subfamilies : Echinostomatinae Faust,1929 for Echinostominae Looss,1899; Echinochasminae Odhner,1910; Chaunocephalinae Travassos,1922; Himasthlinae Odhner, 1910; Ignaviinae Yamaguti,1958; Mehrastominae Saxena,1959; Pegosominae Odhner, 1910; Primatostominae Yamaguti, 1958; Saakotrematinae Yamaguti 1971; Singhiatrematinae Simha,1962; Singhiinae Yamaguti,1958 and Sodalinae Skrjabin et Schulz, 1937.

Odening (1960-1980) described and illustrated morphology, biology and life cycles of Echinostomes from Europe and Asia. He did not accept the validity of Chaunocephalinae and erected a new family Saakotrematidae Odening,1962 for *Saakotrema* Skrjabin et Bashkirova,1956 and elevated Echinochasminae Odhner,1910 to a full family rank.

The family Echinostomatidae has been worked out by a number of workers in India. Swell (1922) for the first time worked on morphology, hosts and systematics of Echinostome cercaria from India. Bhalerao (1926) described a new species of the genus *Echinochasmus* and another belonging to *Stephanora.* He reported many species in between 1926-1943. Gogate (1932) recorded the presence of *Echinochasmus magnovatum.* Verma(1935, 1936) described some new species of *Echinochasmus* and *Echinostomum* from Allahabad and suggested the valvular nature of the excretory bladder in Echinostomes. Asthana (1935) and Srivastava, J.N. (1936) described some new species of *Echinochasmus, Echinostomum* and *Petagifer.* Nigam (1944) described a number of forms under the Echinostomatidae.

Verma (1936) erected *Pseudechinochasmus* for *P. satjivani* without a figure and generic diagnosis. But Srivastava (1974) redescribed this type material with a drawing of the figure and generic diagnosis. Yamaguti (1971) while accepting the genus included it in Echinostomatinae. Kostadinova (2005) considered it a synonym of *Echinoparyphium* but uncertainty of the required data led him to view this genus as *genus inquirendum.* He also treated *Indopseudechinostomum udaipurensis* Sharma(1977) as *genus inquirendum* on account of its description from one specimen only. *Orientochasmus* (Verma, 1935) which was published in a conference abstract without a generic diagnosis was treated as *nomen nudum.* A new genus *Vermatrema was created* by Srivastava (1974) for *Euparyphium longitestis* but due to poor state of the type material Kostadinova (2005) synonymised it with *Hypoderaeum* Dietz,1909. Agarwal (1963)described *Neoechinostoma spinosa* from *Tylo alba* which kostadinova (2005) considered a synonym of *Hypoderaeum gnedini* Bashkirova,1941. He also synonymised *Neocotylotretus udaipurensis* (Sharma, 1977) with *Paryphostomum testitrifolium* Gogate,1934. Singh (1953) described *Echinostoma thapari* from a fresh water fish *Notopterus chitala*. However Yamaguti (1958) created a new genus *Singhia* for *E.thapari* with a separate subfamily Singhiinae Yamaguti,1958 to which he transferred *Caballerotrema* Prudhoe,1960. However Kostadinova and Gibson (2001) did not accept the validity of *Singhia* but reallocated this genus to Echinostomatinae and considered Singhiinae a synonym of Echinostomatinae. Jain (1960) reported life cycles of larval echinostomes from India. Besides *Echinostoma revolutum* Froehlich,1802 recorded by Fotedar and Kaw (1965) from a Mallard duck in Kashmir, the only new species recorded therefrom is *Echinostoma kashmirensis* by Chishti and Ahmed,1992 in *Anas platyrhyncos domesticus*.

While further studying the family, Kostadinova et Gibson,2001,have stressed upon the following important characters for identification at the generic level: "The degree of development of morphology of collar, the number, shape, arrangement and relative size of collar spines; morphology of the male terminal genitalia (cirrus sac, internal seminal vesicle, pars prostatica, size and armament of cirrus); position of ovary and testis; location of vitellaria; tegument armament".

A revision of the family Echinostomatidae Looss, 1899 by Kostadinova ,2005 with morphological characterization has clarified the relationships of various species previously assigned to the family. She is credited with laying the foundation for a thorough revision of the concepts of taxonomy. Her painstaking approach towards examining and

uniting several genera has been exemplary which stands out as a remarkable and valuable contribution. After synonymising several families hitherto described with the Echinostomatidae she distinguished the family with the following diagnostic characters:

Family Echinostomatidae Looss, 1899 (syn. Echinochasmidae odhner, 1910; Chaunocephalidae Travassos,1922; Balfouriidae Travassos,1951; Echinocollidae Odening,1961; Saakotrematidae Odening,1962.)

Diagnosis: Elongated to oval in shape, body cuticle spinose. Head collar muscular beset with one or two crown of spines. Oral sucker subterminal, usually smaller than ventral sucker which lies closer to anterior body end. Prepharynx short but pharynx present. Oesophagus short or long and bifurcates as caeca in forebody to terminate at the posterior extremity ending blindly or forming uroproct. Testes two, tandem in hind body.Cirrus sac muscular in forebody, may extend into hindbody (absent in Pelmastominae), seminal vesicle tubular or saccular, simple or bipartite; pars prostatica well developed. Genital pore immediately behind caecal bifurcation. Ovary anterior to testes, median or dextral. Mehli's gland contiguous with ovary and anterior testis. Follicular vitellaria confined laterally in hind body usually but may also extend into forebody. Seminal receptacle present. Uterus intercaecal, usually preovarian but may also reach beyond testes. Eggs operculate, few to numerous in number. Excretory vesicle Y shaped.

Further, while rejecting the contention of several helminthologists, she accepted the validity of only ten subfamilies and after studying and synonymising several genera she accommodated them in each subfamily as per their distinctness:

Subfamily -1. Echinostomatinae Looss, 1899.

(syn. Paryphostomatinae Mendheim, 1943; Petasigerinae Mendheim,1943; Hypoderaeinae Skrjabin et Bashkirova,1956; Singhiinae Yamaguti,1958; Parallelotestisiinae Mehra,1980; Pameileeniinae Goodman et Wrightsman, 1987. Genera *:* Type genus- *Echinostoma Rudolphy,1809 (syn. Fascioletta* Garrison*,1908; Metechinostoma* Petrochenko et Khrustaleva ,1963); *Prionosomoides* Freitas et Dobbin, 1967; *Singhia* Yamaguti,1958; *Pameileenia* Wright et Smithers, 1956; *Parallelotestis* Belopol'skaya,1954 (syn. *Proechinocephalus* Srivastava,1958); *Petasiger* Dietz,1909 (syn. *Petasiger* (*Neopetasiger*) Bashkirova, 1941; *Navicularia* Mendheim,1943); *Lyperorchis* Travassos,1921; *Longicolia* Bykhovskaya-Pavlovskaya, 1954; *Bashkirovitrema* Skrjabin,1944; *Echinodollfusia* Skrjabin et Bashkirova,1956; *Neoacanthoparyphium* Yamaguti,1958 (syn.*Allopetager* Yamaguti, 1958); *Echinoparyphium* Dietz,1909;*Prionosoma* Dietz,1909; *Hypoderaeum* Dietz,1909 (syn.*Multispinometra* Skr. et Bashk., 1956; *Neoechinostoma* Agarwal,1963; *Vermatrtema*, Srivastav,1974); *Moliniella* Hubner,1939 (syn. *Isoparyphium* Mendheim.,1940); *Drepanocephalus* Dietz,1909; *Paryphostomum* Dietz,1909 (syn. *Neocotylotretus* Sharma,1977); *Isthmiophora* Luhe,1909 (syn. *Echinocirrus* Mendheim,1943); *Euparyphium* Dietz,1909.

Subfamily-2. Chaunocephalinae Travassos, 1922.

Genera: Type genus- *Chaunocephalus* Dietz, 1909; *Balfouria* Leiper, 1908.

Subfamily- 3. Echinochasminae Odhner,1910.

(syn. Microparyphiinae Mendheim,1943; Allechinostomatinae Sudarikov,1950; Mehrastominae Saxena, 1959; Saakotrematinae Odening, 1962).

Genera: Type genus- *Echinochasmus* Dietz,1909 (syn. *Episthmium* Luhe,1909; *Allechinostomum* Odhner, 1910; *Heterechinostomum* Odhner,1910; *Episthochasmus* Verma, 1935; *Velamenophorus* Mendheim, 1940); *Dissurus* Verma, 1936 (syn. *Psilocollaris* Singh, 1954); *Stephanoprora* Odhner, 1902 (syn. *Mesorchis* Dietz, 1909; *Monilifer* Dietz,1909 (accepted as subgenus); *Pseudechinostomum* Shchupakov, 1936 nec Odhner,1910 ; *Aequistoma* Beaver,1942; *Beaverostomum* Gupta,1963); *Mehrastomum*, Saxena, 1959; *Microparyphium* Dietz, 1909; *Pulchrosomoides* Freitas et Lent, 1937; *Saakotrema* Skrjabin et Bashkirova, 1956 (syn. *Opisthometra* Saakova,1952 nec Poche,1925; *Brijicola* Pande,1960; *Echinocollum* Odening, 1961; *Uroproctopisthmium* Fischthal et Kuntz, 1976.

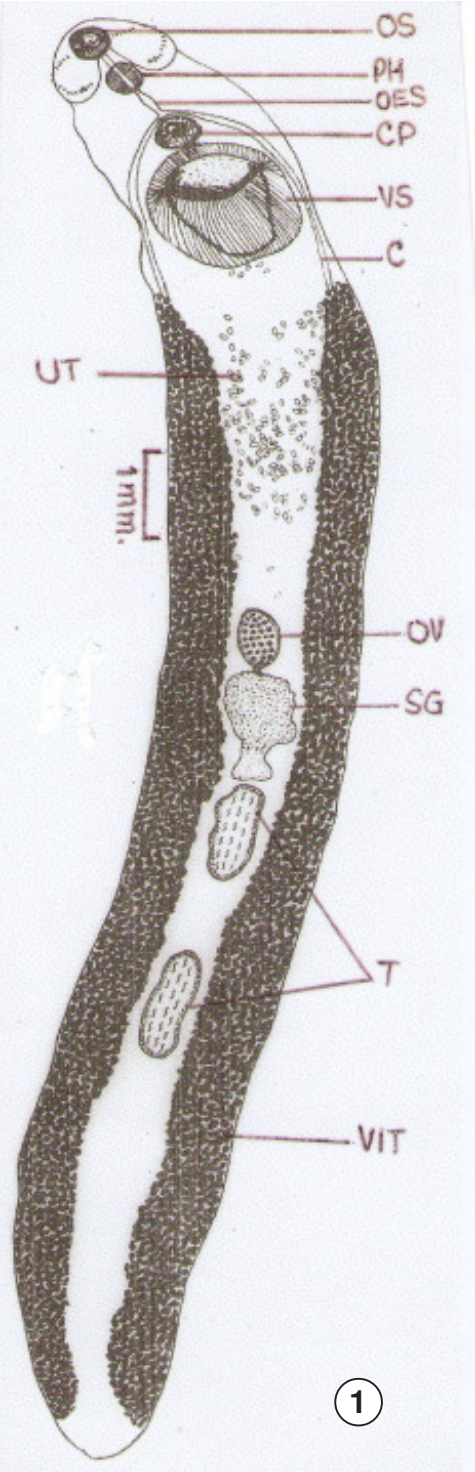
Subfamily-4. Himasthlinae Odhner, 1910.

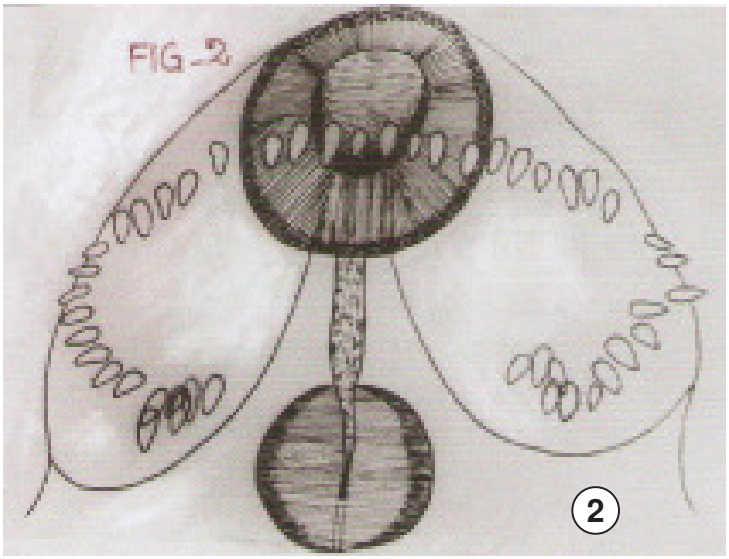
Genera: Type genus- *Himasthla* Dietz, 1909; *Caballerotrema* Prudhoe, 1960; *Artyfechinostomum* Lane, 1915 (syn.*Testifrondosa* Bhalerao, 1924; *Testisacculus* Bhalerao, 1927; *Reptiliotrema* Bashkirova, 1941; *Lepustomum* Jain, 1953; *Neoartyfechinostomum* Agarwal, 1963; *Pseudoartyfechinostomum* Bhardwaj, 1963); *Aporchis* Stossich, 1905 (syn. *Macrechinostomum* Odhner, 1910); *Curtuteria* Reimer (syn. *Himasthloids* Aleekseev, 1965); *Cloeophora* Dietz,1909; *Acanthoparyphium* Dietz, 1909.

Subfamily-5. Ignaviinae Yamaguti,1958.

(syn. Neproechinostomatinae Oshmarin and Belous, 1951)

Genera: Type genus- *Ignavia* Freitas, 1948 (syn. *Nephroechinostoma* Oshmarin et Belous, 1951;





Figs. 1-2 : *Echinostoma bancrofti.* 1.Holotype, entire worm, ventral view. 2. Magnified view of head collar.
Abbreviations: OS-Oral sucker; PH-Pharynx; OES- Oesophagus; CP-Cirrus pouch; VS-ventral sucker; C-Caeca; UT-Uterus; OV-Ovary; SG-Shell gland; Vit-Vitellaria; T-Testes.

Acanthocorpa Oshmarin, 1963).

Subfamily-6. Nephrostominae Mendheim, 1943

Type genus- *Nephrostomum* Dietz, 1909; *Petagifer* Dietz, 1909

Subfamily -7. Pegosominae Odhner, 1910

(syn. Pegosomatinae(*sic*) Skrjabin et Schul'ts, 1937.

Type genus- *Pegosomum* Ratz, 1903

Sybfamily-8. Pelmatostominae Yamaguti , 1958

Type genus- *Pelmatostomum* Dietz, 1909

Subfamily-9. Ruffetrematinae Kostadnova, 2005

Type genus- *Ruffetrema* Saxena and Singh,1982

Subfamily- 10. Sodalinae Skrjabin et Schul'ts, 1937 (syn. Eurycephalinae Skrjabin et Bashkirova, 1937)

Type genus- *Sodalis* Kowalewski, 1902 (syn. *Scapanosoma* Luhe, 1909; *Eurycephalus* Ovcharenko, 1955 *nec* Gray, 1832.

The aim of the present investigation is to describe a brief history of the family Echinostomatidae Looss, 1899 and to present new morphological and anatomical details of *Echinostoma bancrofti* Johnston, 1928.

MATERIAL AND METHODS

Fulica atra also known as Common Coot is a member of the Rallidae family of birds found often in the company of Ducks along rivers,canals,ponds and lakes. Slately black in colour with a white bill it is an omnivore water bird found frequently diving for food consisting of water plants, grass, insects,mollusks, crustaceans and tadpoles.

It is a widely distributed bird found in Europe,

North Africa and Central Asia to Japan, their population swells in India during winters after migrating from Central and West Asia. During the course of a helminthological study of the migratory birds in Srinagar, Kashmir, three mature specimens of the trematode referable to a known species viz., *Echinostoma bancrofti* Johnston,1928 were recovered from the gut contents of two *Fulica atra* in the ratio of one and two respectively. This is the first report of this digenean parasitizing *Fulica atra* and the first record of the species from India.The birds were caught from the Hoksar area on the outskirts of Srinagar through bird catchers and necropsied in accordance with ethical procedures. The dissected organs including viscera were kept in petri dishes with 0.8 Nacl solution and examined under high power of microscope. The digeneans were mounted in toto, compressed-fixed in Bouin's fluid, stained in Ehrlich's haematoxyline, dehydrated in graded series of alcohol, cleared in xylol and kept as whole mounts in Canada balsom. Drawings were made with the help of camera lucida. Identification of the parasite was done at Zoology Department, University of Allahabad. Holotype and paratypes were deposited in the helminthological collections of the said department.

OBSERVATION AND DISCUSSION

Family : Echinostomatidae (Looss,1899), Poche,1926

Subfamily : Echinostomatinae Looss,1899

Genus : *Echinostoma* Rudolphy,1809

Species : *Echinostoma bancrofti* Johnston, 1928

(Fig. 1-2; Table-1)

Description: Redescription based on three mature specimens; all measurements are in mm.

A redescription of *Echinostoma bancrofti* Johnston,1928 is given based on the newly collected s pecimens from the small intestines of two *Fulica atra* at Srinagar,Kashmir. Although its infection in the Hoksar area does not seem to be uncommon, yet bionomics of the parasite has not been studied therefrom. The specimens in my possession were identical to the description given by Johnston,1928 though there are a few disagreements in the morphological structures between the description given by Johnston and the author's collection and these variations have been particularly mentioned wherever necessary.

Body elongated with tapering extremities, tegument covered with minute cuticular spines upto the posterior extent of vitellaria, 15.648-16.3 in length and 1.616-1.888 in maximum breadth in front of ovary. Head collar reniform, 1.168-1.22 broad with prominent lappets; collar spines 44-46 in number arranged in double uninterrupted rows measuring 0.064-0.112 x 0.016-0.048 in size. Oral sucker subterminal, 0.384-0.432 long and 0.4-0.416 broad; prepharynx 0.16-0.24 long; pharynx nearly rounded, 0.288-0.32 x 0.3-0.32 in size; oesophagus slightly longer than pharynx, 0.432-0.576 long; caeca extending upto posterior extremity of body.Ventral sucker well developed, highly muscular,1.718-1.792 behind anterior end, measuring 1.47-1.6 in length and 1.32-1.71 in breadth.

Testes tandem with slightly irregular margins, post-equatorial, 0.72-0.88 distant from each other; anterior testis 1.04-1.088 x 0.336-0.352 in size whereas posterior testis measures 1.088-1.36 x 0.256-0.336. Cirrus pouch 0.224-0.32 long and 0.352-0.56 broad situated in between ventral sucker and intestinal bifurcation; vesicula seminalis occupying most of the space in cirrus sac; ductus ejaculatorius indistinct and prostatic cells well developed. Genital pore immediately behind intestinal bifurcation slightly on the right side. Ovary oval, median and pre-equatorial, 0.496-0.624 in length and 0.416-0.48 in breadth. Shell gland complex is a median elongated mass of diffused cells in between ovary and anterior testis. Uterus confined to the intercaecal space between ovary and ventral sucker. Eggs not many, oval and thin shelled, 0.096-0.112 x 0.064-0.08 in size. Vitellaria commencing a little behind ventral sucker and terminate slightly behind the caecal ends, overlapping caeca throughout their course and even touching body margins.

Remarks: Genus *Echinostoma* Rudolphy, 1809: Type specimen- *Echinostoma revolutum* (Froelich,1802) Rudolphy, 1809 (syn. *E.echinatum* (zeder, 1803); *E.armatum* (Molin, 1858); *E.miyagawati* (Ishii, 1932); *E.paraulum*(Dietz,1909). The parasites of this genus are found in aquatic and terrestrial birds of the families Anatidae, Ardeidae, Columbidae, Corvidae, Phalacrocoracidae, Phasianidae, Rallidae and Scolopacidae; found occasionally in man also. A total of 167 species of *Echinostoma* have been listed by several helminthologists all over the world which includes a large number of species which are similar morphologically. Kostadinova et Gibson, 2001 have identified 120 nominal species which have been described. Gibson (2001) accepted the validity of only 37 species. From India the nine species of *Echinostoma which* have been reported are :

E.bhattacharyai Verma, 1936 in Black winged Stilt; *E.creed* Verma, 1936 in Common Teal; *E. eduardoi* Ghosh et Chauhan, 1977 in *Bandicota bengalensis* (mammal); *E.govindum* Moghe, 1932 in *Philomachus*

Pugnax, Corvus splendens; *E.ivaniosi* Mohandas, 1973; *E.kashmirensis* Chishti et Ahmed, 1992 in *Anas Platyrhynchos; E .longicirrus* Verma, 1936 in *Cygnus olor*; *E.minimum* Verma,1936 in *Cygnus atratus* (Black Swan); *E.rehmani* Rao and Niphadkar, 1963 in dog.

A total of twenty species of Echinostomes belonging to eight Genera (*Echinostom Echinochasmus, Acanthoparyphium, Artyfehinostomum, Episthmium, Himasthla, Hypoderaeum* and *Isthmiophora*) infect humans worldwide. Human Echinostomiasis is an intestinal parasitic disease caused by the heavy infections of Echinostomes resulting in severe abdominal pain accompanied with diarrhoea and malnutrition. Heavy infections may lead to death due to intestinal perforation or malnutrition and anemia as has already been reported by the infection caused by *Artyfechinostomum malayanum (A. mehrai)* in India.The genus *Echinostoma* is also found worldwide and ten species of this parasite have been recorded in humans including *E.hortense, E.macrorchis, E.revolutum, E.ilocanum* and *E.perfoliatum.* Garrison (1908) described human Echinostomes from the Philippines and Leiper (1911-1915) described morphology and biology of adult Echinostomes from humans and other mammals in Indochina (Kanev et al, 2000). *Echinostoma revolutum* is found to be the most widely distributed species from Asia, Oceania to Europe and Americas (Chai J. Y., 2009).The infection takes place where undercooked or raw freshwater snails, clams and fish are eaten which are contaminated with metacercaria of this species. The first report of human infection was in Taiwan in 1929 (Anazawa K, 1929). A few cases of human infection have also been reported in China, Indonesia , Thailand and Cambodia (Woon-Mok Sohn et al, 2011).

Echinostoma bancrofti was described by Johnston from South Australia in 1928. The present location and host is the first record of the species from India. The species though collected from an entirely new host belong undoubtedly to *Echinostoma bancrofti.* It coincides very much in morphological and anatomical features with the original description given by Johnston. However there are conspicuous variations in certain characters between author's collection and the original description which have been commented upon :

1. As is evident from the comparative table (Table-1) the dimensions of body, head collar and pharynx show a definite variation, the present specimens being comparatively larger in size.

2. The number of collar spines ranges between 44-46 in the author's collection instead of 44 as pointed out by Johnston.

3. Anterior testis in the present collection is situated at the commencement of the posterior half of body instead of being at the mid body region as reported by Johnston. The gap between the two testes is also larger as compared to the earlier description by Johnston.

4. Size of Pharynx, oesophagus and cirrus pouch also vary considerably between the author's collection and that of Johnston.

5. The size of the eggs described earlier is comparatively smaller.

The author is confident that these structural differences found between author's collection and those presented by Johnston,1928 are of sufficient magnitude to justify redescription of the species with new combinations if not significant for creation of a new species. These variations could be attributed to different hosts, contraction of the specimen, pressure applied to the cover glass and environmental changes. The author is of the opinion that the two forms are identical for reasons which have been elaborated upon.

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